US Army Corps of Engineers

St Paul District Water Control Center

November 1951 Frazil Ice Jam at St Anthony Falls Locks and Dams

The following memorandum can be found in the St Paul District Water Control Section's Reservoir Regulation Manual for St Anthony Falls Locks and Dams:

UMPRT HJL/RD/irk
26 September 1952

SUBJECT: November 1951 Flood on Mississippi River at Minneapolis, Minnesota

THRU: Division Engineer
Upper Mississippi Valley Division
Corps of Engineers, U.S.Army
St. Louis, Missouri

TO: Chief of Engineers
Department of the Army
Washington 25, D.C.

1. **Authority**. - The following report is submitted in accordance with paragraph 4223.05d, Orders and Regulations, inasmuch as theflood was caused by unusual ice jam conditions, warranting docu-mentation of all related data.

2. **Prior Reports**. - During the ice jam period, daily teletype reports were furnished to the Upper Mississippi Valley Division and to the Chief of Engineers. Letter of UMPVE, dated 7 December 1951, subject "Emergency Action with Respect to Drifting Barges", described existing conditions, the status of affected floating plant, and possible actions which could be taken to prevent damage to structures by barges caught in the ice.

3. **Flood Causes and Related Factors**. - Above normal precipitation during the latter part of October and early in November had resulted in a flow of about 19,000 cfs (about 15,000 cfs above normal) in the Mississippi River at Minneapolis, Minn. on 19 November 1951. By 22 November the flow had decreased to 15,000 cfs and some surface ice was present in Pool No. 1, but there was no restriction to the discharge. During the next few days, below freezing temperatures (extreme low of -6°F and a high of only 24°F) caused the formation of frazil ice which anchored to the surface ice and created a solid barrier in much of the reach of the river above the Lake Street Bridge. Ice, up to 24 feet in depth, extending to the river bottom, was re-ported, and temperatures remained below freezing until the morning of 28 November at which time the temperature rose to a high of 38° F. About noon of that date, another ice jam above St. Anthony Falls broke loose and released a wave into Pool No. 1 which caused the record stages noted in the following tabulation:

Location	Minimum damage stage feet	Crest stage 28 Nov. 51 feet	Maximum stage of record Stage feet	Year

St.Anthony Falls Upper Dam (mile 853.9):				
Pool		99.5	101.2	1916
Tailwater	-	52.6	54.2	1916
St. Anthony Falls Lower Dam (mile 8 53. 5):				
Pool	52.0	51.6	53.3	1916
Tailwater	36.0	49.6	36.4	1916
Minneapolis Barge Terminal(mile 852.6)	34.5	41.2	33.3	1920
Locks and Dam No. 1 (mile 847.6):				
Pool		25.4	30.7	1920

4 **Efforts made to Alleviate Conditions**. On 25 November, Northern States Power Company transferred all possible steam plant loads from generating stations in St. Paul to the Riverside Station above St. Anthony Falls in order to raise the temperature of the river water above the ice jam as much as possible. Also, the city of Minneapolis diverted sewage flows into the river above the falls for the same reason, and the flow from the Headwater Reservoirs was reduced about 2,700 cfs. However, a rise in temperature after 27 November undoubtedly was the major factor in the reduction of the ice jam.

5. **Extent of Damage**. - The unusually high stages due to the ice jam and the ice action that occurred when flow was restored caused the following damages:

a. Damage estimated at $125,000 to the timber decking of the spillway section of the St. Anthony Falls Lower Dam, owned by Northern States Power Company, was disclosed when the tailwater stage returned to normal, and other damages sustained by the power company amounted to $9,000. The cost to the Minneapolis Gas Company plant at mile 853.4 totalled $13,200.

b. The University of Minnesota steam plant on the left bank of the river at.mile 852.9 and steam tunnels and sewer lines to the university were flooded. Steam, generated by the river water contacting the steam pipes, rose into the buildings above and loosened plaster, peeled paint, and warped woodwork. The total cost of the damages was estimated at $30,000.

c. The Western Oil and Fuel Company's river terminal facilities, located on the right bank at mile 852.8, were damaged to the extent of $3,000, and about 2,000 tons of coal valued at $27,600 were lost. The Phillips Petroleum Corporation's river terminal facilities had damages amounting to $1,700, and merchandise stored in a warehouse where water rose three feet above the floor and the facilities at the terminal were damaged in the amounts of $30,700 and $6,800 respectively.

d. On 23 November, nine barges and the towboat Harris broke loose from their moorings at the Minneapolis Municipal Terminal. The towboat and seven of the barges were thrust upon to the dock, but two of the barges were carried downstream where they were caught in the ice above the Franklin Avenue Bridge. Damages to the barges and towboat, including protection and rehabilitation, were estimated to total $101,000.

e. On 23 November, the cofferdam of the St. Anthony Falls

Lower Lock and Dam was overtopped, but only minor damage resulted to the partially completed structure. However, the contractor estimated damages to his equipment and cleanup costs totalled $70,000.

f. Several homes located on the.left bank of the river were flooded above the first floor level and had damages listed at $10,000. Also, owners of houseboats moored in Pool No. 1, incurred expenses totalling about $1,000 in securing their vessels from the force of the flood wave.

6. Summary of damages caused by the flood of November 1951 by the tailwater of Lower St. Anthony Falls Dam:

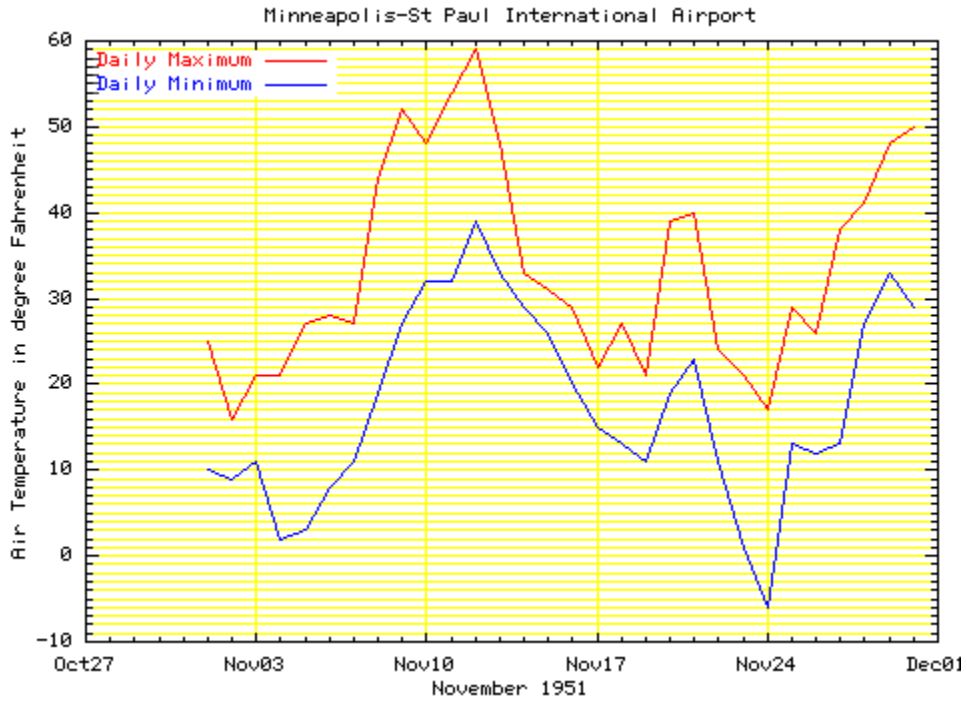
Type of Damage	Estimated Cost
Public utilities	$147,200
St. Anthony Falls Lower Lock and Dam Project	70,000
University of Minnesota	30,000
Industrial	32,300
Navigation	138,500
Other	11,000
Total	$429,000

Pertinent engineering data for this event:

Air temperatures in degrees Fahrenheit recorded at the Minneapolis-St Paul International Airport		
Date	**Maximum**	**Minimum**
Nov 01	25	10
Nov 02	16	9
Nov 03	21	11
Nov 04	21	2
Nov 05	27	3
Nov 06	28	8
Nov 07	27	11
Nov 08	44	19
Nov 09	52	27
Nov 10	48	32
Nov 11	54	32
Nov 12	59	39
Nov 13	48	33

Nov 14	33	29
Nov 15	31	26
Nov 16	29	20
Nov 17	22	15
Nov 18	27	13
Nov 19	21	11
Nov 20	39	19
Nov 21	40	23
Nov 22	24	11
Nov 23	21	1
Nov 24	17	-6
Nov 25	29	13
Nov 26	26	12
Nov 27	38	13
Nov 28	41	27
Nov 29	48	33
Nov 30	50	29

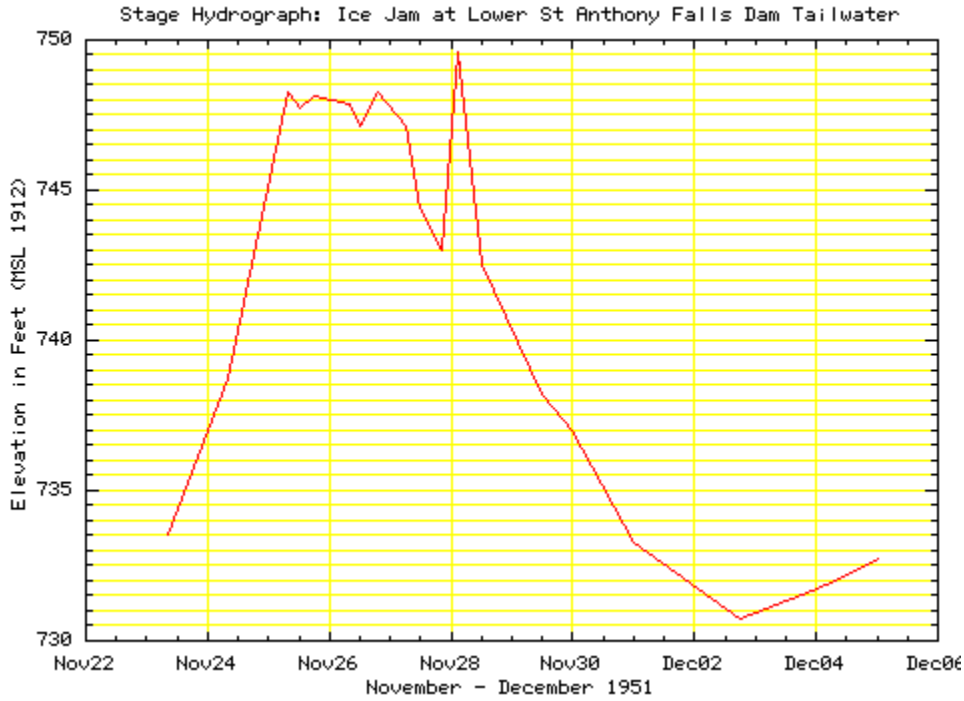
Daily maximum and minimum air temperatures
acquired from the National Weather Service.



Lower St Anthony Falls Tailwater Stage readings: November-December 1951		
Date	**Hour**	**Elevation (MSL 1912)**
Nov 23	08:00	733.50
Nov 24	08:00	738.71
Nov 25	08:00	748.27
Nov 25	12:00	747.7
Nov 25	18:00	748.1
Nov 26	08:00	747.84
Nov 26	12:00	747.1
Nov 26	19:00	748.3
Nov 27	06:00	747.1
Nov 27	12:00	744.4
Nov 27	20:00	743.0
Nov 28	03:00	749.57
Nov 28	12:00	742.5

Nov 29	12:00	738.2
Nov 30	00:00	737.0
Dec 01	00:00	733.3
Dec 02	18:00	730.7
Dec 03	18:00	731.5
Dec 04	08:00	732.0
Dec 05	00:00	732.7

Lower St Anthony Falls Tailwater Stage Hydrograph



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